

3) Integration of Trigonometric Functions

Rules:

$$\int \cos[f(x)] \, dx = \frac{1}{f'(x)} \sin[f(x)] + c$$

$$\int \cos(ax + b) \, dx = \frac{1}{a} \sin(ax + b) + c$$

$$\int \sin(ax + b) \, dx = -\frac{1}{a} \cos(ax + b) + c$$

$$\int \sec^2(ax + b) \, dx = \frac{1}{a} \tan(ax + b) + c$$

$$\int \sec(ax + b) \cdot \tan(ax + b) \, dx = \frac{1}{a} \sec(ax + b) + c$$

$$\int \operatorname{cosec}(ax + b) \cdot \cot(ax + b) \, dx = -\frac{1}{a} \operatorname{cosec}(ax + b) + c$$

$$\int \operatorname{cosec}^2(ax + b) \, dx = -\frac{1}{a} \cot(ax + b) + c$$

Examples: Integrate these functions

1) $\int \sin(4x) \, dx$

$$\int \sin(4x) \, dx = -\frac{1}{4} \cos(4x) + c$$

2) $\int \operatorname{cosec}^2(2x) \, dx$

$$\int \operatorname{cosec}^2(2x) \, dx = -\frac{1}{2} \cot(2x) + c$$

3) $\int 3 \sin(2x) \, dx$

$$\int 3 \sin(2x) \, dx = 3 \int \sin(2x) \, dx = 3 \cdot -\frac{1}{2} \cos(2x) + c = -\frac{3}{2} \cos(2x) + c$$

4) $\int \operatorname{cosec}(3x) \cdot \cot(3x) \, dx$

$$\int \operatorname{cosec}(3x) \cdot \cot(3x) \, dx = \frac{-1}{3} \operatorname{cosec}(3x) + c$$

5) $\int 4 \sec(5x) \cdot \tan(5x) \, dx$

$$\int 4 \sec(5x) \cdot \tan(5x) \, dx = 4 \int \sec(5x) \cdot \tan(5x) \, dx = 4 \cdot \frac{1}{5} \sec(5x) + c = \frac{4}{5} \sec(5x) + c$$

6) $\int \cos(4x + 1) \, dx$

$$\int \cos(4x + 1) \, dx = \frac{1}{4} \sin(4x + 1) + c$$